Microsoft®

Windows® 2000

Operating System

Introduction to Windows 2000 Change and Configuration Management

White Paper

Abstract

This paper presents an overview of the Microsoft® Windows® 2000 Change and Configuration Management features – the features that administrators can use to centrally manage desktops in their organization.

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CHANGE AND CONFIGURATION MANAGEMENT

INTRODUCTION

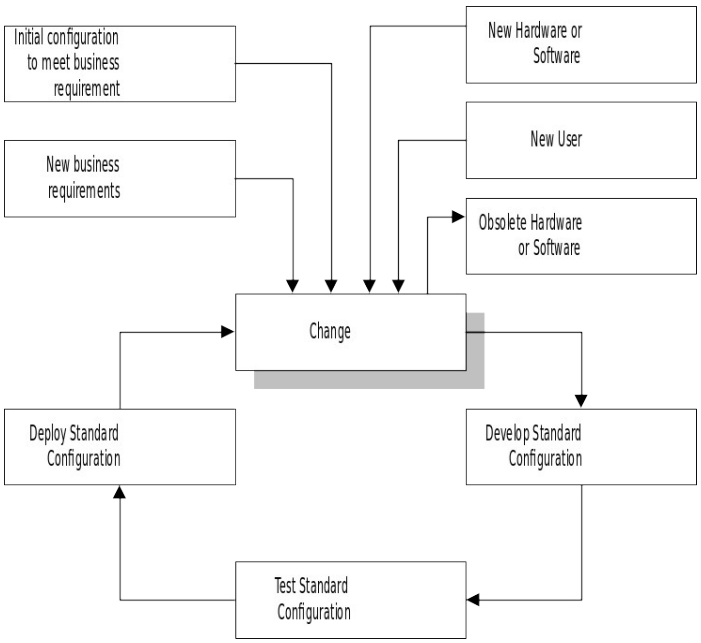
This is the second paper in a series of papers that introduce Windows management services. The first paper, "*Introduction to Windows Management Services*," introduced the differing management roles (of support personnel) and disciplines (management tasks)[1], as well as the management services on which Microsoft and other companies will be providing solutions to improve the manageability of computers in both a Windows-based and a heterogeneous environment.

This paper provides more detailed information on one of these disciplines--Change and Configuration Management. It explains the concepts of Change and Configuration Management and presents information on how managers can use the Change and Configuration Management features of the Windows 2000 operating system to reduce their organization's Total Cost of Ownership (TCO). It provides an introductory overview of the features and products that Microsoft provides to fulfill its *Zero Administration for Windows* initiative:

- IntelliMirror™ management technologies
- Remote OS Installation
- Systems Management Server version 2.0

As its name implies, the Change and Configuration Management discipline involves managing the ongoing changes and configuration issues that arise as administrators try to ensure that people are productive when they use their computers to complete their day-to-day work.

[1] *Management roles*. Within many organizations, the task of managing computer systems is typically divided between several groups, with each group performing a specific management role. Three roles typically found in many organizations are desktop management, network management, and data center management.
Management disciplines. Regardless of their role, administrators are concerned with the following management disciplines: change and configuration management, security management, performance management, batch and output management, event management, problem management, and storage management.



Change

Many factors introduce change into an organization, and one of the key management issues is managing change. Regardless of which factor initiates the change, whether it is the initial configuration to address business requirements or adapting to new business requirements, the impact of new hardware and software technologies, or the obsoleteness of existing systems, change is inevitable for a dynamic, growing organization.

Configuration

Configuration refers to the act of deploying change. All support groups must manage change; therefore, Change and Configuration Management is an important discipline for all support groups, regardless of their management role[2].

Windows 2000 and Change and Configuration Management

The standard Change and Configuration Management features in Windows 2000 provide the following advantages:

- Administrators can centrally define computing environment settings for both groupings of people and computers. Then they can rely on the system to enforce those settings.
- Administrators can quickly replace a computer and then automatically regenerate this environment, restoring people's data,

[2] New configurations have to be developed, tested, and deployed, and this is an on-going process.

applications, preferences, and administrative policies.

- Administrators can allow end users to roam to any computer on their network and have the same computing environment, including access to their data, applications[3], and preference settings.
- End users can quickly find all their user data files and access their network files even when working offline—files are cached locally and are automatically synchronized between the server and the local version.
- Administrators can centrally manage software installation, update, and removal[4]. This eliminates the need for user intervention during installation of their software and for helpdesk support personnel to visit desktops.
- Administrators can define options that allow workstations[5] to automatically install operating system files on the local hard drive from a remote server.

A key concept with Windows 2000 Change and Configuration Management is that after administrators install a Windows 2000 environment, they can use the Active Directory and create policy-based managed computing environments for groups of users and computers. In this way, they significantly reduce the need to visit people's desktops for application or operating system installation, updates, or to repair unauthorized or unexpected configuration changes. As a result, they can substantially lower Total Cost of Ownership.

Change and Configuration Management consists of the following features included in Windows 2000: IntelliMirror and Remote OS Installation. Additionally, value added Change and Configuration Management features are provided in Microsoft Systems Management Server 2.0.

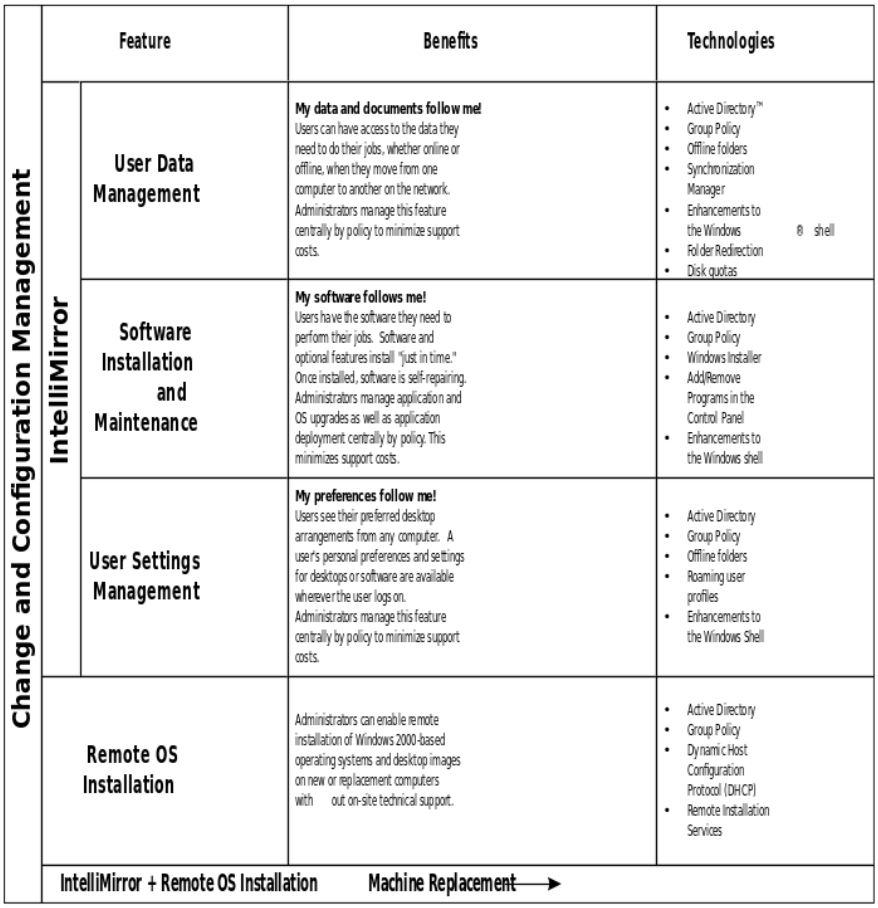
[3] Applications that meet the *Designed for Microsoft Windows Logo* requirements.

[4] Applications can even repair themselves automatically if users inadvertently remove key files.

[5] Requires PC client hardware that supports a PXE environment. For details, see "Remote OS Installation," on Page 11 of this document.

Windows 2000 Change and Configuration Management Features

The following table highlights the standard Change and Configuration Management features included in Windows 2000 and the underlying technologies that enable these features. Administrators can use some or all of these features, depending on their particular business



Change and Configuration Management	Feature	Benefits	Technologies
IntelliMirror	User Data Management	**My data and documents follow me!** Users can have access to the data they need to do their jobs, whether online or offline, when they move from one computer to another on the network. Administrators manage this feature centrally by policy to minimize support costs.	• Active Directory™ • Group Policy • Offline folders • Synchronization Manager • Enhancements to the Windows 0 shell • Folder Redirection • Disk quotas
IntelliMirror	Software Installation and Maintenance	**My software follows me!** Users have the software they need to perform their jobs. Software and optional features install "just in time." Once installed, software is self-repairing. Administrators manage application and OS upgrades as well as application deployment centrally by policy. This minimizes support costs.	• Active Directory • Group Policy • Windows Installer • Add/Remove Programs in the Control Panel • Enhancements to the Windows shell
IntelliMirror	User Settings Management	**My preferences follow me!** Users see their preferred desktop arrangements from any computer. A user's personal preferences and settings for desktops or software are available wherever the user logs on. Administrators manage this feature centrally by policy to minimize support costs.	• Active Directory • Group Policy • Offline folders • Roaming user profiles • Enhancements to the Windows Shell
	Remote OS Installation	Administrators can enable remote installation of Windows 2000-based operating systems and desktop images on new or replacement computers with out on-site technical support.	• Active Directory • Group Policy • Dynamic Host Configuration Protocol (DHCP) • Remote Installation Services
	IntelliMirror + Remote OS Installation	Machine Replacement →	

requirements.

* *IntelliMirror* is an attribute of these features; it is described later in this section.

Value Added Solutions: Microsoft Systems Management Server 2.0

Systems Management Server 2.0, now redesigned to make full use of Windows management services, complements the built-in management functionality of Windows 2000. Systems Management Server has a highly modular design that allows it to be used as a stand-alone solution or as an integrated part of a larger management solution. In pre-Windows 2000 environments, Systems Management Server 2.0 provides advanced Change and Configuration Management to a full range of Windows-based systems, including Windows 95 and Windows 98, Windows NT® versions 3.51 and 4.0, and Windows for Workgroups operating systems. In

INTELLIMIRROR

Windows 2000 Server environments, Systems Management Server will complement the Active Directory, extending the standard Change and Configuration Management features provided by IntelliMirror, to deliver an enterprise-scale Change and Configuration Management solution for Windows environments.

IntelliMirror is a set of powerful features native to Windows 2000 for desktop Change and Configuration Management that combines the advantages of centralized computing with the performance and flexibility of distributed computing. Leveraging different features in both the server and client, IntelliMirror enables the users' data, applications, and settings to follow them throughout their environment.

All users have data and settings that are specific to each of them. IntelliMirror increases the availability of the user's computer and computing environment by intelligently storing information, settings, and applications based on policy definitions. IntelliMirror is able to recover, restore, or replace users' data, applications, and personal settings in a Windows 2000-based environment. Therefore, users have constant access to all of their information and applications, whether or not they are connected to the network, with the assurance that their data is safely maintained and available from the server.

With IntelliMirror, a common theme is *"Follow Me!"* as it can be set to allow users' data, their applications, and their personal settings to follow them to any desktop on the network.

At the core of IntelliMirror are three features:

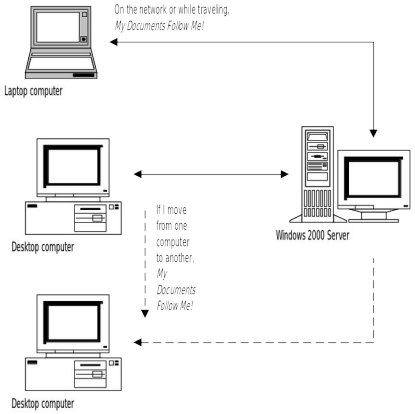
- User Data Management
- Software Installation and Maintenance
- User Settings Management

Administrators can use these IntelliMirror features either separately or together, depending on the requirements of the environment. When fully deployed, IntelliMirror uses the Active Directory and Group Policy to provide policy-based management of users' desktops. Through centrally defined policies based on the users' business roles, group memberships, and location, Windows 2000 Professional desktops will automatically reconfigure to meet a specific user's requirements each time that user logs onto the network.

User Data Management

The User Data Management features ensure that people's data (such as personal files and documents) is easily accessible, readily available, and always protected—users can access their data from any computer wherever they log in, whether online or offline.

The User Data Management features of IntelliMirror support the mirroring of people's data to the network and the local caching of selected network data. These features ensure that data is protected, it is available offline, and it is available from any computer on the network. It should be noted


On the network or while traveling, My Documents Follow Me!
Laptop computer
Desktop computer
Windows 2000 Server
If I move from one computer to another, My Documents Follow Me!
Desktop computer

that data follows the user *only* if the data is stored in a location set to roam, such as in the **My Documents** folder.

Data Accessibility

With the IntelliMirror features enabled, data can follow a person when the person roams to another computer on the network. This provides increased accessibility as people can use any computer on the network to access their data.

Data Availability

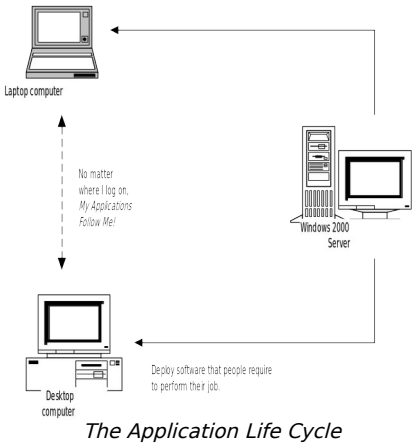
Administrators can enable the User Data Management IntelliMirror features to ensure that the most up-to-date versions of people's data resides on both the local computer and on the server. Local caching maintains data on the local computer even when it is disconnected from the network so that data is readily available to people, even when working offline.

Data Protection

Administrators can provide improved protection of user data by ensuring that users' data, though apparently local, is also redirected to a network share, and through administrator-managed backup of network servers.

Software Installation and Maintenance

The Windows 2000 Software Installation and Maintenance feature is designed to facilitate policy-based deployment and management of software through the entire software life cycle.


Laptop computer
No matter where I log on, My Applications Follow Me!
Windows 2000 Server
Deploy software that people require to perform their job.
Desktop computer

The Application Life Cycle

Windows 2000 Software Installation and Maintenance provides robust just-in-time software installation and automatic repair of applications to groups of users and computers. Administrators can also use this feature to upgrade deployed applications, retire and remove earlier applications that are no longer required, and deploy both service packs and operating system upgrades.

Administrators use Windows 2000 Group Policy to define software installation options that specify which software is to be deployed, upgraded, or removed from a computer. Software installation policies can be applied both to groups of users and computers. These policies are defined on the basis of sites, domains, and Organizational Units (OUs). Each time a computer is turned on, computer-based software installation Group Policy is assessed and the computer is updated. Each time a user logs into a computer, user-related software installation Group Policy is assessed, and the desktop is updated to make available the required applications.

A key technology used to perform just-in-time software installation is the Windows Installer service. To use the Windows 2000 Software Installation and Maintenance feature, software must be authored or repackaged to make use of this service[6]. Windows Installer service fully automates the process of software installation and configuration.

By using Group Policy and Software Installation, administrators can either *publish* or *assign* software to groups of users and computers.

Published software is made available to users for use on an ‘as required’ basis. Administrators can select what software is made available to users based on the business, technical, and geographic requirements of each group. Users can install software that has been published to them by using the **Add/Remove Programs** Control Panel tool and selecting the software from a list of published applications. Alternatively, users can also open a file or document that requires a published application, and the required software will be installed automatically, the application will start, and the file will open.

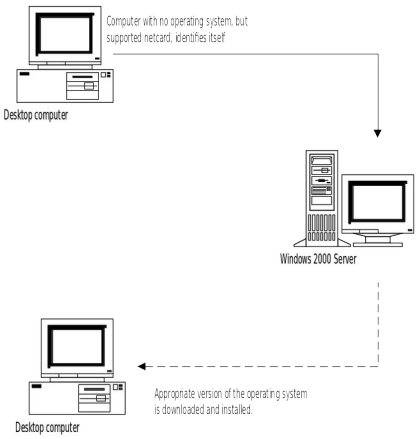
[6] Authoring and packaging tools for Windows Installer service are available from a number of companies including InstallShield, Seagate, and Wyse. Additionally, System Management Server Installer, a feature of Systems Management Server 2.0, will support a Windows Installer service repackaging option.

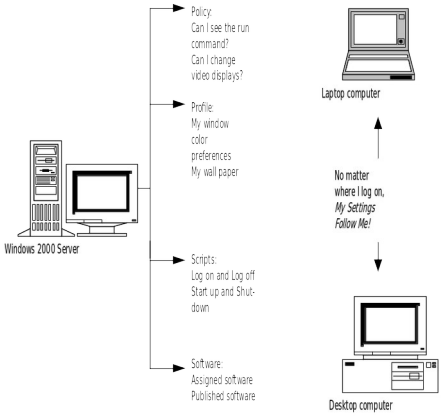
In comparison, by *assigning* software to users and computers, administrators mandate that the software be installed. When administrators assign software to a computer, the software is installed the next time the computer is rebooted. This feature can be used to deploy service packs, driver updates, and other computer-related software, for example. When administrators assign software to an end user, the software appears on the user's desktop (for example, on the **Start** menu, desktop shortcuts, and so on) the next time the user logs into the network. The software is installed the first time the user activates it (by selecting it from the **Start** menu, for example).

Using the features of Windows Installer service, after applications are installed, they are protected from inadvertent deletion of application files or other required resources. Each time an application is launched, the Windows Installer service checks to ensure that all the required application files and components are available. If any are missing, the Windows Installer service retrieves and installs the missing components from a predetermined distribution point either on the local computer or the network such as a Distributed File System (Dfs) share.

User and Computer Settings Management

The advantages of User and Computer Settings Management are that administrators can *centrally* define computing environments for groupings of users and computers and they *automatically* get the correct environment. Administrators can add new users and computers, define settings for groupings of people and computers, and apply changes for groups of people. Furthermore, with the IntelliMirror feature enabled, administrators can restore user's settings if their computer fails, and ensure that a user's desktop settings follow the person if he or she roams to another computer.


Computer with no operating system, but supported netcard, identifies itself
Desktop computer
Windows 2000 Server
Appropriate version of the operating system is downloaded and installed.
Desktop computer



Windows 2000 Change and Configuration Management includes functionality that allows administrators to centrally define specific computing environments for groupings of users and computers. This includes settings for software policies, scripts, software installation, customized user settings, and security.

Administrators can use Group Policy to define settings for groupings of users and computers. These settings include registry settings on the desktop (such as operating system components and applications), scripts (for computer startup and shutdown, and user logon and logoff), software installation options (such as the applications that are available to users and those that appear on their desktop), and security settings (such as for local computer, domain, and network security settings). Additionally, administrators can redirect any of the special folders in a user profile to a network share so that user profiles are available wherever a user logs in.

Remote OS Installation uses the new Pre-Boot eXecution Environment (PXE) Dynamic Host Configuration (DHCP)-based remote boot technology to initiate installation of an operating system from a remote source to a client's local hard disk. The remote source – a server that supports the new Remote Installation Services (RIS) – provides the network equivalent of a CD-based installation of Windows 2000 Professional and pre-configured Sysprep desktop images.

- **CD-based installation.** The CD-based option is similar to setting up a workstation directly from the Windows 2000 Professional compact disc; however, the source files reside across the network on available RIS Servers.

SYSTEMS MANAGEMENT SERVER

- **Sysprep image format.** The Sysprep imaging option allows a network administrator to clone a standard desktop configuration, complete with OS configurations and desktop customizations. After first installing and configuring Windows 2000, its services, and any standard applications on a workstation, the network administrator runs a wizard that prepares the installation image and replicates it to available RIS Servers. Remote boot–enabled client computers can then request to install that image locally from the available RIS servers on the network.

Either the client computer's BIOS[7] or a special remote boot floppy can initiate a network service boot. When a network service boot is requested, DHCP provides an IP address for the client computer, and the client can then download the client installation wizard. At this point, the wizard will prompt the user to log on, and, depending on the user's credentials or security group membership, the wizard will display a menu that offers appropriate customized unattended operating system installation options. (The network administrator uses policy settings to determine which installation options are available to a user, based on the policy defined for that user at the client machine that initiated the network service boot request.)

Systems Management Server 2.0 provides scalable change and configuration management of Windows-based personal computers in an enterprise. Based on the native management infrastructure provided by Windows management services, Systems Management Server 2.0 allows regional and central desktop management support personnel to work together using an integrated set of tools that provide hardware and software inventory collection, software distribution and installation, software metering, and helpdesk diagnostics and troubleshooting. Systems Management Server can be used to complement the built-in features of Windows 2000 Change and Configuration Management, as well as being used in pre-Windows 2000 environments. Systems Management Server supports all Windows 16-bit and 32-bit desktops, from Windows 3.1 to Windows 2000, whether operating in a Windows NT, NetWare 3.1, or NetWare NDS environment.

As a stand-alone desktop management system or as the desktop management component within an integrated enterprise management solution, Systems Management Server 2.0 includes the following facilities:

[7] Requires hardware that supports the Pre-Boot eXecution Environment (PXE) DHCP-based boot ROM. Hardware that conforms to the Net PC or Office PC requirements in PC 98 meets these requirements.

Hardware and Software Inventory—Systems Management Server uses Windows Management Instrumentation (WMI)[8] and new version resource information software scanners to upload a wealth of detailed hardware and software inventory information into a SQL Server™-based repository. This provides administrators with a dynamic, efficient mechanism for getting hardware and software information on every application on every PC. Additionally, a new compliance comparative database tool has been added which can evaluate inventory after it is collected and generate reports on compliance status. This is especially useful for identifying year 2000 applications.

Software Distribution and Installation—Using Systems Management Server 2.0, administrators can deploy applications to machines, users, and user groups. Software distribution is now rules-based, and distribution targets are dynamically evaluated. It is also fully integrated with inventory to allow sophisticated targeting. Systems Management Server 2.0 first performs a query of software inventory and collection information, it targets an audience, and then deploys software to that audience according to administrator-defined rules.

For example, if a new user joins a user group, software will now automatically be sent to them according to the group's policy. With Systems Management Server 2.0, administrators can distribute an application immediately if a situation requires it, and they can rollback applications – this includes the ability to uninstall software automatically when a user moves to a different department.

[8] The Windows Management Instrumentation (WMI) technology is compatible with the Desktop Management Task Force's (DMTF) Web-Based Enterprise Management (WBEM) initiative. It takes advantage of the DMTF Common Information Model (CIM) to represent managed objects in Windows-based environments.

FOR MORE INFORMATION

Software Metering—Administrators often require tools to track software usage by users, groups, workstations, time, or license quota. Systems Management Server 2.0 can monitor, analyze, and if required, control the use of applications on servers and workstations. These tools provide administrators varying levels of control, ranging from simple alerts to the ability to prevent applications from running.

Diagnostics and Troubleshooting—In addition to reporting on the current state of a workstation or server and providing remote control facilities, Systems Management Server also provides a range of advanced diagnostic tools. These include tools such as a network monitor with real time and post-capture experts to analyze network conditions and performance, and a server HealthMon tool which can track critical performance information on a Windows NT Server and BackOffice® family application processes.

For the latest information on Windows NT Server, check out our World Wide Web site at http://www.microsoft.com/ntserver the Windows NT Server Forum on the Microsoft Network (GO WORD: MSNTS).

Management and Overview Papers

The following table lists a series of papers that introduce Microsoft's Windows management services and Change and Configuration Management. These papers are intended for managers and technical decision makers who need to understand the business requirements for, and the benefits of management features, as well as Microsoft's management architecture, tools, and solutions. We recommend that you read these in the order listed below.

Title	**Content**	**Point your browser to:**
Introduction to Windows Management Services	An overview of the management roles and disciplines, as well as the architecture for management solutions that will be available either as part of the operating system or as an add-on.	http://www.microsoft.com/ntserver/management.
Introduction to Change and Configuration Management	An overview of the Change and Configuration Management and an introduction to how Microsoft's products such as Windows 2000 IntelliMirror, Remote OS	http://www.microsoft.com/ntserver/management.

	Install and Systems Management Server address this management discipline.	
IntelliMirror	An overview of the features of Windows 2000 IntelliMirror and scenarios for how organizations can benefit from IntelliMirror.	http://www.microsoft.com/ntserver/management.
Remote OS Installation	An overview of the features of Remote OS Installation and scenarios illustrating how organizations can benefit from IntelliMirror.	http://www.microsoft.com/ntserver/management.
Systems Management Server	An overview of the features of Systems Management Server, and discussion of its benefits.	http://www.microsoft.com/ntserver/management and http://www.microsoft.com/smsmgmt.

Technical Papers

The following table lists additional technical papers that are or will be available for administrators and Information Technology (IT) managers who are interested in understanding the details of Windows management services features and technologies.

More information on	**Will be available in this web site:**
Active Directory	http://www.microsoft.com/ntserver/management.
Group Policy	http://www.microsoft.com/ntserver/windowsnt5/techdetails/techspecs.
Windows Installer Service	http://www.microsoft.com/ntserver/management.
Software Installation and Maintenance	http://www.microsoft.com/ntserver/management.
Remote OS Installation Service	http://www.microsoft.com/ntserver/management.
User Documents and Settings	http://www.microsoft.com/ntserver/management.
Windows Management Instrumentation (WMI)	http://www.microsoft.com/ntserver/management.